

## Appendix A

### Marked- Up Version of Paragraph at Page 21, lines 8-11

The aforementioned precursors of the present invention provide Ta source reagents that have beneficial volatility characteristics for applications such as chemical vapor deposition, and are easily and economically synthesized. The Ta source reagents of the invention [utilized] utilize molecular geometries that are controlled by subtle steric effects.

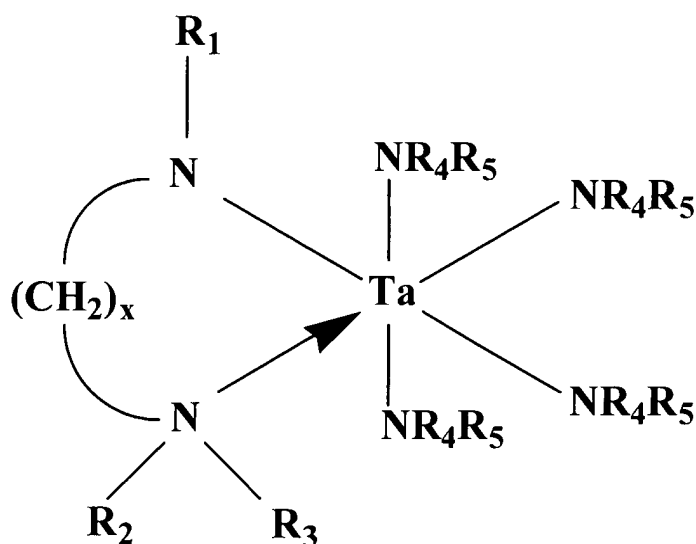


## Appendix B

### Marked-Up Version of Claims 5 and 6

5. (Amended) A method of forming Ta or Ti material on a substrate from a precursor, comprising vaporizing said precursor to form a precursor vapor, and contacting the precursor vapor with the substrate to form said Ta or Ti material thereon, wherein the precursor comprises at least one tantalum and/or titanium species selected from the group consisting of:

(i) tethered amine tantalum complexes of the formula:



wherein:

x is the integer 2 or 3;

each of  $\text{R}_1$ - $\text{R}_5$  is independently selected from the group consisting of H,  $\text{C}_1$ - $\text{C}_4$  alkyl, aryl,

$\text{C}_{1-6}$  perfluoroalkyl and trimethylsilyl;

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(ii)  $\beta$ -diimines of the formula:



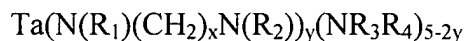
wherein:

G is a  $\beta$ -diimino ligand;

each Q is selected from the group consisting of H, C<sub>1</sub>-C<sub>6</sub> alkyl, aryl and C<sub>1-6</sub> perfluoroalkyl; and

x is an integer from 1 to 4 inclusive;

(iii) tantalum diamide complexes of the formula



wherein:

x is the integer 1 or 2;

y is the integer 1 or 2;

each of R<sub>1</sub>-R<sub>4</sub> is independently selected from the group consisting of H, C<sub>1</sub>-C<sub>4</sub> alkyl, aryl, perfluoroalkyl, and trimethylsilyl;

(iv) tantalum amide compounds of the formula

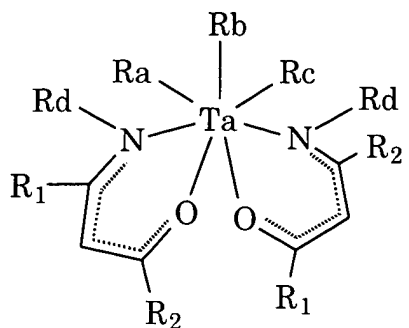


wherein each R and R' is independently selected from the group consisting of H, C<sub>1-4</sub> alkyl, phenyl, perfluoroalkyl, and trimethylsilyl, subject to the proviso that in each

NRR' group, R  $\neq$  R';

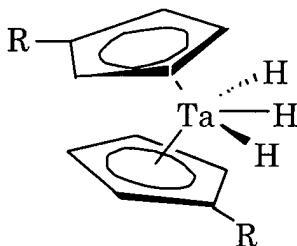


(v)  $\beta$ -ketoimines of the formula



wherein each of  $R_1$ ,  $R_2$ ,  $R_a$ ,  $R_b$ ,  $R_c$  and  $R_d$  is independently selected from H, aryl,  $C_1$ - $C_6$  alkyl, and  $C_1$ - $C_6$  perfluoroalkyl; and

(vi) tantalum cyclopentadienyl compounds of the formula



wherein each  $R$  is [independently selected from the group consisting of H, methyl, ethyl, isopropyl, t-butyl, and] trimethylsilyl;

(vii)  $Ta(NR_1R_2)_x(NR_3R_4)_{5-x} / Ti(NR_1R_2)_{[x]y}(NR_3R_4)_{4-[x]y}$

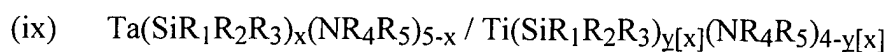




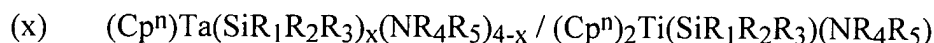
wherein each of  $R_1$ ,  $R_2$ ,  $R_3$  and  $R_4$  are independently selected from the group consisting of H,  $C_1$ - $C_8$  alkyl, aryl,  $C_1$ - $C_8$  perfluoroalkyl or a silicon-containing group selected from the group consisting of silane, alkylsilane, perfluoroalkylsilyl, triarylsilane and alkylsilylsilane, wherein x is an integer from 1 to 5 inclusive; and y is an integer from 1 to 4 inclusive;



wherein each of  $R_1$ ,  $R_2$ , and  $R_3$  are independently selected from the group consisting of H,  $C_1$ - $C_8$  alkyl, aryl,  $C_1$ - $C_8$  perfluoroalkyl or a silicon-containing group selected from the group consisting of silane, alkylsilane, perfluoroalkylsilyl, triarylsilane and alkylsilylsilane, with the proviso that  $R_1 \neq tBu$  and  $R_2 \neq R_3 = Et$ ;



wherein each of  $R_{1-5}$  is independently selected from the group consisting of H, Me, Et,  $tBu$ , Ph,  $iPr$ ,  $CF_3$ ,  $SiH_3$ ,  $SiMe_3$ ,  $Si(CF_3)_3$ ,  $Si(Et)_3$ ,  $Si(iPr)_3$ ,  $Si(tBu)_3$ ,  $Si(Ph)_3$ , and  $Si(SiMe_3)_{z[x]}(Me)_{3-z[x]}$ , wherein x is an integer from 1 to 4 inclusive; y is an integer from 1 to 3 inclusive; and z is an integer from 1 to 3 inclusive; and



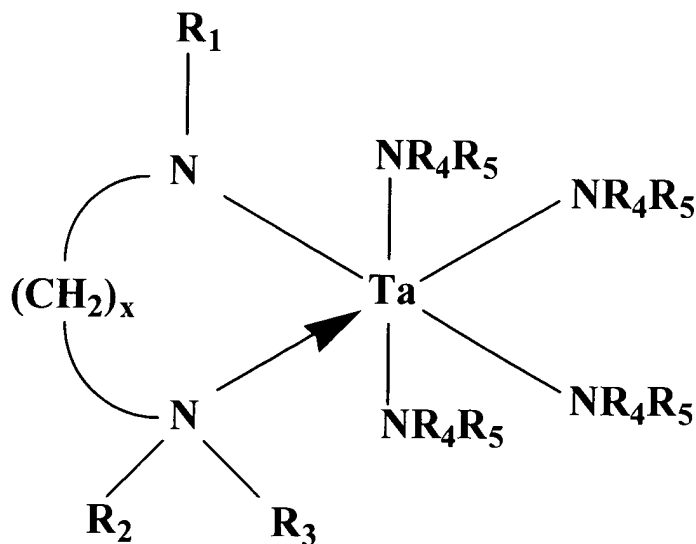
wherein each of  $R_{1-5}$  is independently selected from the group consisting of H, Me, Et,  $tBu$ , Ph,  $iPr$ ,  $CF_3$ ,  $SiH_3$ ,  $SiMe_3$ ,  $Si(CF_3)_3$ ,  $Si(Et)_3$ ,  $Si(iPr)_3$ ,  $Si(tBu)_3$ ,  $Si(Ph)_3$ ,  $Si(SiMe_3)_{y[x]}(Me)_{3-y[x]}$  and  $Cp^n$  is  $C_5H_{z[x]}Me_{(5-z[x])}$ , wherein x is an integer from 1 to 3



inclusive; y is an integer from 1 to 3 inclusive; and z is an integer from 0 to 5 inclusive [= 0-5)].

6. (Amended) [A] The method according to claim 5, of forming Ta material  
[wherein said material formed] on said [the] substrate [is TaN, and the] , wherein said  
precursor is a tantalum species selected from the group consisting of[:] tantalum species  
(i), (ii), (iii), (iv), (v) and (vi), and wherein said Ta material is TaN

[(i) tethered amine tantalum complexes of the formula:



wherein:

X is 2 or 3;

each of  $\text{R}_1\text{-R}_5$  is independently selected from the group consisting of H,  $\text{C}_1\text{-C}_4$  alkyl, aryl,  $\text{C}_1\text{-C}_6$  perfluoroalkyl, and trimethylsilyl;

(ii)  $\beta$ -diimines of the formula:





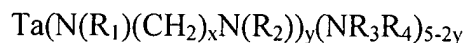
wherein:

G is a  $\beta$ -diimino ligand;

each Q is selected from the group consisting of H, C<sub>1</sub>-C<sub>6</sub> alkyl, aryl and C<sub>1</sub>-C<sub>6</sub> perfluoroalkyl; and

x is an integer from 1 to 4 inclusive;

(iii) tantalum diamide complexes of the formula



wherein:

x is 1 or 2;

y is 1 or 2;

each of R<sub>1</sub>-R<sub>4</sub> is independently selected from the group consisting of H, C<sub>1</sub>-C<sub>4</sub> alkyl, aryl, perfluoroalkyl, and trimethylsilyl;

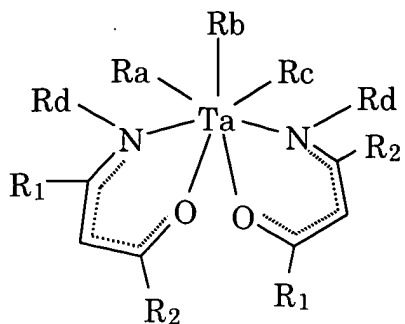
(iv) tantalum amide compounds of the formula



wherein each R and R' is independently selected from the group consisting of H, C<sub>1</sub>-C<sub>4</sub> alkyl, phenyl, perfluoroalkyl, and trimethylsilyl, subject to the proviso that in each NRR' group, R  $\neq$  R';

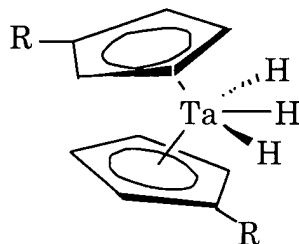
(v)  $\beta$ -ketoimines of the formula





wherein each of  $R_1$ ,  $R_2$ ,  $R_a$ ,  $R_b$ ,  $R_c$  and  $R_d$  is independently selected from H, aryl,  $C_1$ - $C_6$  alkyl, and  $C_1$ - $C_6$  perfluoroalkyl; and

(vi) tantalum cyclopentadienyl compounds of the formula



wherein each R is independently selected from the group consisting of H, methyl, ethyl, isopropyl, t-butyl, trimethylsilyl].